Interacting Dimensions of Diversity: Cross-Categorization and the Functioning of Diverse Work Groups

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Abstract

We conducted an experiment to show how the interplay between informational diversity and other dimensions of diversity can account for some of the inconsistent effects of informational diversity in previous research. 70 four-person groups involved in a decision-making task received homogeneous or heterogeneous information. By manipulating gender composition and bogus personality feedback we created groups that either had a potential faultline (a basis for subgroup categorization) or were homogeneous on these dimensions. In potential faultline groups, heterogeneity of information either converged with or cross-cut the other dimensions of diversity. Results showed that informational diversity enhanced group functioning when it was crossed rather than converged with the potential faultline.

KEYWORDS: DIVERSITY, GROUP PROCESSES, INFORMATION ELABORATION, CROSS-CATEGORIZATION

Interacting Dimensions of Diversity:
Cross-Categorization and the Functioning of Diverse Work Groups

Work group diversity is a central aspect of organizational life. It influences important aspects of team functioning, such as information processing, team climate, satisfaction, and conflict (Milliken & Martins, 1996; Williams & O'Reilly, 1998). One type of diversity that has the potential to enhance team functioning is informational diversity--differences in knowledge, perspectives, and ideas (Jehn, Northcraft, & Neale, 1999; van Knippenberg & Haslam, 2003). More in particular, it has been argued that informational diversity stimulates group members to thoroughly elaborate task-relevant information and to use this information as input in their decision-making process (van Knippenberg, De Dreu, & Homan, 2004). Unfortunately, however, groups often experience difficulties exploiting the potential of diverse perspectives and information (Bowers, Pharmer, & Salas, 2000; Webber & Donahue, 2001).

For informational differences to be put to use, groups have to be willing to exchange and elaborate upon information of all group members. However, informationally diverse groups are often also diverse on other, more salient dimensions of diversity, such as gender, ethnicity, and personality. These salient social categories may give rise to subgroup categorization--especially when multiple salient categories converge--leading to increased conflicts and a negative team climate, and hindering the elaboration of task-relevant information (e.g., Earley & Mosakowski, 2000; Thatcher, Jehn, & Zanutto, 2003). It has been proposed, therefore, that the positive effects of informational diversity can only be harvested when groups are homogeneous on other diversity dimensions (e.g., Gruenfeld, Mannix, Williams, & Neale, 1996; Jehn et al., 1999; also see Triandis, Kurowski, & Gelfand, 1994). Extending this work, we argue that even groups whose members are diverse on other dimensions (e.g., gender, personality) may profit from informational diversity. We propose

that the combination of informational diversity and other dimensions of diversity may either deteriorate or enhance group functioning, depending on how the two interact. Specifically, we argue that *cross-categorization* of different diversity dimensions may contribute to enhanced group functioning by decreasing conflict and enhancing information elaboration.

We begin with a review of previous research on the effects of diversity on group functioning. We then focus on the notion of salience of social categories to introduce faultline theory and the concept of cross-categorization, and discuss how crossing diversity dimensions may positively influence group dynamics. Subsequently we apply these notions to understand how the effects of informational diversity on group functioning may be contingent on the relationship between informational diversity and other dimensions of diversity, and report the results of an experiment testing hypotheses derived from this analysis.

Work Group Diversity and Group Functioning

Diversity refers to differences between individuals on any attribute that may lead to *the perception that another person is different from the self* (e.g., Jackson, 1991; Triandis et al., 1994; Williams & O'Reilly, 1998). As stated above, diversity may have important effects on group functioning. Below we outline two competing perspectives that have been advanced to further understanding of the relation between group diversity and group functioning: the information/decision-making perspective and the social categorization perspective (Williams & O'Reilly, 1998).

According to the information/decision-making perspective *informational diversity* can enhance the elaboration of task-relevant information and perspectives within the group--that is, the exchange, discussion, and integration of ideas, knowledge, and insights relevant to the group's task (see e.g., van Knippenberg et al., 2004). Informational diversity can be defined as "differences in knowledge basis and perspectives that members bring to the group" (Jehn

et al., 1999, p. 743), and has also been referred to as functional diversity or knowledge diversity (e.g., Pelled, Eisenhardt, & Xin, 1999; Phillips, Mannix, Neale, & Gruenfeld, 2004). The potential positive effect of informational diversity thus lies in the thorough and elaborate processing of the diverse information, especially for tasks that require the combination and integration of different perspectives and ideas. Informational diversity may indeed stimulate error detection (e.g., Davis, 1969), information processing (e.g., Phillips et al., 2004), group problem solving (e.g., Tjosvold & Poon, 1998), and group effectiveness (e.g., Gruenfeld et al., 1996). Thus, the existence of diverse perspectives within a work group can potentially lead to enhanced team functioning through information elaboration.

The social categorization perspective gives rise to a different prediction. Within diverse teams, subgroup categorization can create "us-them" distinctions, and these distinctions can in turn lead to intergroup bias, such as in-group favoritism or prejudice (Brewer & Brown, 1998; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). Members of heterogeneous groups may indeed experience more relationship conflict and be less satisfied than members of homogeneous groups (e.g., Jehn et al. 1999; Pelled et al., 1999; Wharton & Baron, 1991). Furthermore, diversity has been shown to negatively affect team climate (e.g., Alagna, Reddy, & Collins, 1982; Chatman, Polzer, Barsade, & Neale, 1998; Tsui & O'Reilly, 1989) as well as overall group functioning (e.g., Ancona & Caldwell, 1992; Gruenfeld et al., 1996; Harrison, Price, & Bell, 1998; Simons, 1995; Triandis, Hall, & Ewen, 1965). Diversity can thus undermine group functioning by stimulating subgroup categorization, which may become manifest in increased conflict, bad team climate, decreased satisfaction, and suboptimal group functioning.

Integrating these two perspectives, van Knippenberg et al. (2004) proposed that in diverse groups subgroup categorization processes and information elaboration processes interact to determine group functioning. When subgroup categorization occurs, they argue,

information elaboration is hindered, and group functioning deteriorated. However, subgroup categorization and concomitant intergroup bias do not necessarily always occur within diverse groups. Whether diverse groups experience subgroup categorization processes is determined by the salience of social categories within the group.

Salience of Social Categories

Among other things, the salience of subgroups is influenced by the *comparative fit* of the subgroup-categorization (Oakes, Haslam, & Turner, 1994; Turner et al., 1987). Comparative fit is a function of the perceived differences within and between categories (i.e., groups), and increases to the extent that group members perceive differences within subgroups to be less than differences between subgroups. For example, comparative fit is high when one subgroup within a team consists of 50-year old males, and the other subgroup consists of 20-year old females (i.e., when age and gender are correlated). Conversely, comparative fit is low when a team consists of 20-year old and 50-year old males and females (i.e., when age and gender are uncorrelated). The higher the comparative fit of possible subgroups within the diverse team, the more people will be inclined to perceive the group as consisting of subgroups (i.e., subgroup categorization; Brewer, 2000; Brewer & Gaertner, 2001; Earley & Mosakowski, 2000; Hewstone, Rubin, & Willis, 2002). This notion of social category salience has recently been introduced in the diversity literature in the form of faultline theory (e.g., Earley & Mosakowski, 2000; Lau & Murnighan, 1998; Thatcher et al., 2003).

Faultline theory. Inevitably, work group members differ on a variety of dimensions, and these differences may be correlated to a greater or lesser degree (e.g., gender differences in a group may be independent of age differences, but gender and age may also covary). It has been proposed that diverse groups will experience negative effects of diversity especially when multiple diversity dimensions converge within the group (i.e., when the group has a

diversity faultline; e.g., Jehn, 1999; Pelled et al., 1999; Thatcher et al., 2003). When diversity dimensions converge (i.e., are correlated), comparative fit is higher, and this makes social categories more salient (Doise, 1978; Oakes et al., 1994; Thatcher et al., 2003). Corroborating this idea, Lau and Murnighan (1998) argue that convergence or alignment of multiple diversity characteristics increases the salience of subgroups, resulting in suboptimal communication and deteriorated group functioning. Recently, Lau and Murnighan (2005) indeed showed that strong faultlines resulted in more intragroup conflict, and lower satisfaction than weak faultlines. Along similar lines, Phillips et al. (2004) showed that within four-person groups diverse information was less elaborated upon when it was divided in alignment with the existing subgroups.[1] However, different diversity dimensions do not always converge within groups--they may also cross-cut each other. Although several authors have acknowledged this idea (e.g., Brewer, 1995; Phillips, 2003; Phillips et al., 2004), so far no research has been done to examine the effects of cross-categorization of different diversity dimensions on team functioning.

Cross-categorization. Just as comparative fit is increased when different dimensions of diversity converge, comparative fit is *reduced* when diversity dimensions cross-cut each other (Brewer & Brown, 1998; Hewstone et al., 2002). For example, when the male members of a work group are relatively old while the female members are relatively young, subgroup categorization (i.e., older men vs. younger women) is more likely than when differences along the dimensions cross-cut each other. That is, if some men and women are relatively old and some men and women are relatively young, the differences between gender categories and age categories become smaller, because people will have something in common with each other on one of the dimensions. A meta-analysis by Migdal, Hewstone, and Mullen (1998) indeed showed that convergence of attributes leads to an accentuation of the differences between and the similarities within categories (i.e., high comparative fit), while

the crossing of two category dimensions accentuates similarities between the categories and differences within each category (i.e., low comparative fit). Although the beneficial effects of cross-categorization have been demonstrated in a number of studies (e.g., Brown & Turner, 1979; Deschamps, 1977; Marcus-Newhall, Miller, Holtz, & Brewer, 1993), the results are limited to intergroup bias (e.g., stereotyping and resource allocation) in non-interactive, simulated groups, and little is known about the effects of cross-categorization on actual group functioning. The present study aims to fill this void by investigating how cross-categorization affects group functioning in diverse groups.

The Present Study

Previous research has been unable to reliable link informational diversity to group functioning. That is, some studies have found positive effects of informational diversity (e.g., information elaboration; Gruenfeld et al., 1996), whereas other studies report negative effects (e.g., subgroup categorization and intergroup bias; Simons, 1995). We argue that whether informational diversity will lead to subgroup categorization or information processing depends on how the informational diversity dimension relates to other salient diversity dimensions (cf. Gruenfeld et al., 1996; Jehn et al., 1999; Mohammed & Angell, 2004; van Knippenberg et al., 2004). The potential positive effects of informational differences are most likely to be impeded when diverse groups experience a faultline situation (Lau & Murnighan, 1998; Phillips et al., 2004; Thatcher et al., 2003). We propose that when informational diversity *converges* with other salient diversity dimensions, the salience of the subgroup categorization will increase, and intergroup biases will be elicited, hindering the elaboration of information and deteriorating group functioning. Conversely, when informational diversity is *crossed* with other diversity dimensions, this may not only decrease the salience of the social category but also enhance team functioning and promote information elaboration. Extending earlier research, we thus propose that differences on other diversity dimensions

need not disrupt the positive effects of informational diversity, but will do so to the extent that informational diversity is correlated with these differences.

This idea was tested in a controlled study with small interactive groups engaged in a decision-making task, in which we manipulated informational diversity and created a potential faultline based on the alignment of other dimensions of diversity. To map the combined effects of informational diversity and other dimensions of diversity on group processes, we focused on a number of variables that span a wide range of aspects of group functioning, including information elaboration, task and relationship conflict, team climate, and satisfaction. These variables were chosen based on research on the effects of diversity on group processes, which roughly divides the consequences of diversity into three dimensions: task-related processes, relational processes, and individual affective/evaluative responses (e.g., Milliken & Martins, 1996; Williams & O'Reilly, 1998). Task-related processes concern the effects diversity may have on the group's information elaboration and decision making processes. Information elaboration is obviously one of the most crucial variables that may be classified under this header. However, task conflict may also be seen as a task-related effect of diversity (e.g., Jehn et al., 1999; Pelled et al., 1999). Differences in information and viewpoints may give rise to task conflict and dissent, and faced with the need to solve these conflicts and reconcile opposing views, group members may engage in more elaborate information processing (e.g., De Dreu, Harinck, & van Vianen, 1999; Jehn et al., 1999; Pelled et al., 1999; Tjosvold, 1998).

Beside task-related consequences, diversity may also affect relational processes. In this respect, negative effects of diversity on team climate and relationship conflicts have been reported (cf. Milliken & Martins, 1996). Furthermore, a recent meta-analysis by De Dreu and Weingart (2003) indicates that task conflict is often negatively (rather than positively) related to team functioning and affective outcomes. Given that conflict in general is inherently

affectively laden and may feed back on relationships between group members, task conflict can thus also be seen as a relational consequence of diversity. In support of this notion, Simons and Peterson (2000) showed that when trust within the team is low (e.g., when there is intergroup bias) both relationship conflict and task conflict increase, suggesting that the task conflict may be indicative of similar relational processes as relationship conflict.

Third, we looked at group members' satisfaction. An often-quoted consequence of diversity is that it may negatively affect affective/evaluative responses to the group, as may be evident in for instance reduced satisfaction and commitment to the group and increased intention to turnover (Milliken & Martins, 1996; Williams & O'Reilly, 1998). Group members' satisfaction may thus be considered to be an additional indicator of the quality of group processes in diverse work groups.

Below, six hypotheses regarding the effects of informational diversity and potential faultlines on task-related, relational, and affective/evaluative group processes and outcomes are advanced. Regarding elaboration of information we expect that groups will engage in more elaborate information processing when they are informationally heterogeneous than when they are informationally homogeneous, except when informational heterogeneity is converged with a potential faultline (*Hypothesis 1*). For the relational and affective/evaluative outcomes we predict that potential faultlines (as compared to homogeneity) will lead to lower satisfaction (*Hypothesis 2a*), less positive team climate (*Hypothesis 2b*), and more relationship conflict (*Hypothesis 2c*), except when the potential faultline is cross-cut by informational heterogeneity. Because task conflict has both task-related and relational components, two competing hypotheses regarding the effects of diversity on task conflict can be advanced. On the one hand, groups may experience more task conflict when they are informationally heterogeneous, except when informational heterogeneity is converged with a potential faultline (*Hypothesis 3a*). On the other hand, it can be predicted that task conflict

will increase when there is a potential faultline, except when the potential faultline is cross-cut by informational heterogeneity (*Hypothesis 3b*).

Method

Sample

A total of 280 students (178 females and 102 males) of the University of Amsterdam participated in the experiment for course credit or monetary compensation (Euro 10, approximately USD 12). Most participants were psychology undergraduates (n = 222). The mean age of the participants was 21 years. The participants were randomly assigned to one of the experimental conditions. A total of 70 four-person groups participated in the experiment. Four groups were not included in the analyses because one or more of the members accurately guessed the true goals of the experiment prior to the experimental task. The groups were videotaped during their interaction. One group could not be videotaped due to technical problems. The videotapes were coded to obtain more objective measures of the variables of interest where possible.

Design

We manipulated informational heterogeneity versus homogeneity and the absence versus presence of a potential faultline formed by other dimensions of diversity (gender and bogus personality feedback). These two manipulations were combined to create a one-factor design with five conditions: (1) potential faultline with informational homogeneity (the *PoFau-InfoHom* condition; n = 13); (2) potential faultline converged with informational heterogeneity (the *Converged* condition; n = 13); (3) potential faultline crossed with informational heterogeneity (the *Crossed* condition; n = 13); (4) no potential faultline with informational heterogeneity (the *NoPoFau-InfoHet* condition; n = 14); and (5) no potential faultline with informational homogeneity (the *NoPoFau-InfoHom* condition; n = 13). Creating these five conditions was necessary to test and compare all possible combinations of

the two diversity dimensions and thereby enable an accurate test of our hypotheses.

Procedure

On arrival in the laboratory, participants were individually welcomed to the experiment and presented with written instructions.

Creating a potential faultline. To create a potential faultline situation we manipulated a number of diversity dimensions. To make these diversity dimensions as salient as possible we chose to manipulate and stack gender composition, feedback on a fake personality test, color of baseball caps, and seating arrangements (cf. Gaertner, Mann, Murrell, & Dovidio; 1989; Marcus-Newhall et al., 1993).[2] Gender composition of the groups was manipulated, because research has shown that gender is often used as a basis for categorization (Stangor, Lynch, Duan, & Glass, 1992). In the potential faultline conditions we created four-person groups consisting of two males and two females; in the no potential faultline conditions the groups consisted of four males or four females. On top of the gender manipulation, participants were given bogus feedback on a fake personality test, and they received colored baseball caps that corresponded with their gender and supposed personality type (cf. Gaertner et al., 1999). Additionally, same-sex group members were seated next to each other. The specific procedure that was employed to manipulate the potential faultline is detailed below.

First, participants read instructions, which stated that the present research aimed to determine the effect of personality on cooperation in a group decision-making task. Then, the participants were asked to fill out a (fake) personality test. After filling out the questionnaire, their answers were supposedly analyzed, and their personality type determined. After about ten minutes, the experimenter returned with the results. The feedback that the participants received stated that they had an H or a K personality type (cf. van Prooijen & van Knippenberg, 2000) and that during the group interaction they had to wear a black (type H) or beige (type K) baseball cap. Participants then received some superficial information about

their personality type. The bogus personality feedback was not task-related and all the personality traits reported in the feedback were positive. In the conditions with no potential faultline all group members had the same personality types (and the same color cap); in the potential faultline conditions personality type was aligned with gender such that the two males had the same personality type and the two females had the same personality type.

Finally, seating was used to make the potential faultline more salient. After all participants had read the information about the task, they were seated in a new room in which the group would be performing the task. Same-gender group members were always seated next to each other at a rectangular table, facing the opposite-gender members. Such converging of diversity dimensions (i.e., gender, [bogus] personality feedback, seating) results in high within-subgroup similarity and high between-subgroup differences, which makes subgroup categorization more likely (Turner et al., 1987; van Knippenberg et al., 2004; cf. Gaertner et al., 1989). We thus created a perfect potential faultline in the sense that differences in gender, (bogus) personality feedback, and seating arrangement were perfectly correlated (cf. Lau & Murnighan, 1998; Thatcher et al., 2003).

Manipulation of informational diversity. After the personality test, the participants received the instructions for the decision-making task. We used the Desert Survival Exercise (for a description see Johnson & Johnson, 1982) in which 12 objects have to be ranked in importance. A pretest showed that this task was not gender-related.[3] Before working on the task, participants received some information about surviving in the desert, which was used to manipulate informational diversity. In the informationally homogeneous conditions, every group member received the total set of information. In the informationally heterogeneous conditions this information was divided in two equally informative parts (part A and part B).[4] Two group members received part A and two group members received part B. When groups had a potential faultline, this information was either converged or crossed with the potential

faultline. In the converged condition, two males received information set A, and two females received information set B. In the crossed condition, one male and one female received information set A, and one male and female received information set B. After reading the information, participants first worked on the ranking task by themselves. After they were finished, participants were brought to another room and were seated together in four-person groups. They then had 30 minutes to work on the decision-making task together and to determine the group's ranking of the objects. The groups were free to decide which decision rule they wanted to use. The groups were videotaped during the interaction and the group members all wore their baseball caps. When the group was finished, participants were asked to fill out a questionnaire. After that they were debriefed and thanked.

Dependent Variables

The main dependent variables were information elaboration, team climate, satisfaction, relationship conflict, and task conflict. Conflict and team climate were coded from the videotapes. Two individuals who were blind to the hypotheses randomly coded 29% of the tapes. We assessed the inter-rater reliability by computing intraclass correlations (ICC, Shrout & Fleiss, 1979). Because all intraclass correlations were excellent (see below), the remaining 71% of the tapes were coded by a single coder.

Information elaboration and satisfaction were measured by a questionnaire that was administered after the experiment. The answers to the questions could be given on a 7-point Likert scale, with higher numbers indicating positive answers.

Questionnaire Data

Manipulation checks. Three items were used to check the manipulation of informational diversity (e.g., "Other group members had different opinions about what is important for surviving in a dessert than I did," and "The group members often had the same ideas as I did about what was important for surviving in the desert [recoded]"). Reliability analysis showed

that these seven questions indeed measured the same concept (M = 3.62, SD = 1.18, α = .70). For the manipulation check of the potential faultline manipulation we also used 7 items, which were combined in one scale (e.g., "The members of the group are similar to each other," and "The members of this group have a lot in common"; M = 4.52, SD = 1.11, α = .91).

Information elaboration. This variable was measured with three questions (e.g., "During the group task I actively processed the information provided by the other group members," and "During the task things were said that gave me new ideas"; M = 4.90, SD = 1.11, α = .78).[5] Because, as far as we know, there are no existing questionnaires measuring information elaboration within work groups, we developed these questions based on the definition of information elaboration as provided by van Knippenberg et al. (2004).

Satisfaction. Four questions were asked to determine how satisfied participants were with the cooperation within the group (e.g., "I'm satisfied with the cooperation within this group," and "I have the impression that the cooperation within this group went well"; M = 5.74, SD = 0.62, α = .96). This measure was an altered and extended version of a three-item questionnaire developed by Thomas, Ravlin, and Wallace (1996).

Audio-Video Data

Team climate. Team climate was rated on five 5-point scales for coziness, friendliness, informality, perseveration, and hostility (the last two items were reverse coded), and these ratings were combined in one scale (M = 3.65, SD = 0.99, α = .84). These keywords were chosen based on the subscale *participative safety* from the Team Climate Inventory (Anderson & West, 1996), which measured how safe people feel to participate in their team. The average intra-class correlation for the two raters was .93, which is considered "excellent" according to the criteria for reliability coefficients developed by Cicchetti and Sparrow (1981).

Relationship conflict. Relationship conflicts are recognized interpersonal incompatibilities among group members, and are characterized by frustration, friction and personality clashes within the group (e.g., Jehn, 1995; Ross, 1989). Therefore, we measured relationship conflict by coding the videotapes by counting the number of times negative remarks that were made about individuals in the group or the group as a whole (M = 0.19, SD = 0.39, ICC = .99). Examples of some negative remarks are "We should never have gone into the desert with women, they don't know how to survive"; "you men are so stubborn"; and "I can see you have a different personality type, you're obnoxious."

Task conflict. Task conflicts are disagreements among group members about the task being performed, and are characterized by conflicts of ideas in the group and disagreement about content and issues of the task (e.g., Jehn, 1995). Hence, we coded the videotapes for task conflict by counting the number of times negative remarks that were made about information that was provided and about the way the task was handled (M = 9.19, SD = 5.94, ICC = .99). Examples of some negative remarks are "This is not the way we should approach this task" and "You're wrong about the flashlight, it has batteries and it won't work in the heat."

Results

Treatment of the Data

Information elaboration and satisfaction were measured at the individual level and aggregated on the group level, because group data are not independent (Kashy & Kenny, 2000). Tables 1 and 2 provide an overview of the means, standard deviations, and correlations of the dependent variables. To make sure that the correlations among the dependent variables were not caused by the manipulations, we also calculated partial correlations by controlling for condition. This was done by creating four dummy variables representing the five conditions (Cohen, Cohen, West, & Aiken, 2003; Hays, 1988). Table 1

shows that relationship conflict is positively related to task conflict, and that both constructs are negatively correlated with satisfaction. However, the latter correlation is much stronger in case of relationship conflict. This pattern of results is very similar to the meta-analytic results by De Dreu and Weingart (2003), and it points to the validity of these measures.

Although the hypotheses predict an interaction between two dimensions of diversity, the only way to test this was by conducting an experiment with five conditions, which creates a non-orthogonal design. The differences of interest were thus predicted to occur between combinations of groups. Performing an omnibus test in this case (i.e., an ANOVA testing for differences between the five conditions) cannot locate differences between conditions, and results in a substantial loss of power (Judd, McClelland, & Culhane, 1995). Therefore, in order to test our hypotheses, we computed hypothesis-relevant contrasts using the oneway analysis of variance procedure, along with Cohen's *d* effect size estimates (1988). According to Cohen, effect sizes of about 0.20 are small, effect sizes around 0.50 are moderate, and effect sizes above 0.80 are large. Table 3 provides an overview of the specific contrasts that we computed to test our hypotheses.

Manipulation Checks

The planned comparison for the manipulation check of informational diversity showed that this manipulation had the desired effect. In the PoFau-InfoHom condition (potential faultline with informational homogeneity; $M = 3.46$, $SD = .47$) and the NoPoFau-InfoHom condition (no potential faultline with informational homogeneity; $M = 3.09$, $SD = .69$) the participants perceived the information that the group had received as being more homogeneous than in the other conditions (Converged condition: $M = 4.09$, $SD = .39$; Crossed condition: $M = 4.42$, $SD = .72$; NoPoFau-InfoHet condition [i.e., no potential faultline with informational heterogeneity]: $M = 4.23$, $SD = .51$), $t[61] = 7.11$, $p < .001$, $d = 10.55$.

For the potential faultline manipulation planned comparisons showed that this manipulation too had the intended effect. The NoPoFau-InfoHet condition (M = 4.82, SD = .46) and NoPoFau-InfoHom condition (M = 4.93, SD = .90) differed significantly from the PoFau-InfoHom condition (M = 4.18, SD = .61), from the Crossed (M = 4.42, SD = .56), and from the Converged condition (M = 4.24, SD = .59), $t(61) = 3.95$, $p < .001$, d = -6.98, showing that groups in the potential faultline conditions perceived themselves as more diverse on this dimension than did groups in the no potential faultline conditions.

Dependent Variables

Information elaboration. As predicted in Hypothesis 1 planned comparisons showed that participants in the homogeneous information conditions (i.e., PoFau-InfoHom and NoPoFau-InfoHom) elaborated significantly less information than did participants in the heterogeneous information conditions (i.e., Crossed and NoPoFau-InfoHet), but only when the diversity variables did not converge within the group (i.e., Converged condition), $t(61) = 3.50$, $p < .001$, d = .82 (see Table 2 for means and standard deviations).

Satisfaction. Consistent with Hypothesis 2a, planned comparisons showed that participants in the no potential faultline (i.e., NoPoFau-InfoHom and NoPoFau-InfoHet) and Crossed conditions were more satisfied than were groups in the Converged and PoFau-InfoHom conditions, $t(61) = -2.76$, $p < .01$, d = -.67.

Team climate. In line with Hypothesis 2b, planned comparisons showed that groups in the no potential faultline (i.e., NoPoFau-InfoHom and NoPoFau-InfoHet) and Crossed conditions had a more positive team climate than did groups in the Converged and PoFau-InfoHom conditions, $t(61) = -3.07$, $p < .01$, d = .73.

Relationship conflict. In keeping with Hypothesis 2c, planned comparisons showed that groups in the no potential faultline (i.e., NoPoFau-InfoHom and NoPoFau-InfoHet) and Crossed conditions experienced less relationship conflict than did groups in the Converged

and PoFau-InfoHom conditions, $t(61) = -1.99$, $p < .05$, $d = -.50$.[5]

Task conflict. Recall that for task conflict two alternative hypotheses were advanced. Hypothesis 3a predicted that groups would experience more task conflict when they were informationally heterogeneous, except when informational heterogeneity was converged with the potential faultline. Planned comparisons yielded no support for this prediction, $t(61) = 1.26$, *ns*. Instead, planned comparisons showed that groups in the no potential faultline (i.e., NoPoFau-InfoHom and NoPoFau-InfoHet) and Crossed conditions had less task conflict than did groups in the Converged and PoFau-InfoHom conditions, $t(61) = -2.01$, $p < .05$, $d = -.50$. These results support Hypothesis 3b.

Discussion

The results of the present study support our hypotheses that the effects of informational diversity are dependent on its relationship with other dimensions of diversity within the group. As predicted, groups in which gender and bogus personality feedback formed a potential faultline were less satisfied, had a more negative team climate, and experienced more relationship conflicts than homogeneous groups. However, and in line with our theorizing, these effects were mitigated when the potential faultline was cross-cut by informational diversity. Informational diversity per se did not influence relational and affective/evaluative processes, but when it converged with a potential faultline groups had more conflicts, experienced more negative team climate, were less satisfied, and processed less information. Cross-cutting informational diversity and the potential faultline, however, resulted in less relationship conflict, a better team climate, greater satisfaction, and increased elaboration of information. These results were found in questionnaire data as well as in data coded from audio-video recordings of group interaction. Thus, answering our main research question about the potential positive effects of informational diversity, we showed that informational diversity *decreases* group functioning when it *converges* with other salient

dimensions of diversity, but informational diversity *increases* group functioning when it *cross-cuts* other salient dimensions. Hence, these results show that informational diversity can enhance group functioning even when groups are diverse on other dimensions.

Two alternative hypotheses for task conflict were advanced. Hypothesis 3a predicted that task conflict would be affected by interacting diversity dimensions in the same way as the elaboration of information, meaning that groups should experience more task conflict when they are informationally heterogeneous, except when informational heterogeneity is converged with a potential faultline. Conversely, Hypothesis 3b predicted that task conflict would be affected by diversity dimensions analogous to relationship conflict, team climate, and satisfaction, meaning that task conflict should be higher when groups have a potential faultline, except when the faultline is cross-cut by informational heterogeneity. The data support Hypothesis 3b: Potential faultlines caused task conflicts in the same way that they caused relationship conflicts, suggesting that task conflict is associated more with the negative effects than with the positive effects of (informational) diversity.

Theoretical and Practical Implications

An idea that is implicit in some previous research on diversity in work groups is that the beneficial effects of informational diversity might only occur when groups are homogeneous on other dimensions of diversity, especially visible diversity dimensions such as demographic characteristics. This idea has received support in various studies (e.g., Gruenfeld et al., 1996; Jehn et al., 1999; also see Triandis et al., 1994). The present results provide an important qualification of this notion by showing that informational diversity can also have positive effects on group functioning in groups that are diverse on other dimensions, as long as both types of diversity are crossed rather than converged. This finding has a number of important implications, which are discussed below.

Given the increasing diversity of the workforce, work groups are inevitably composed

of members with different demographic backgrounds, values, and perspectives. A large body of research has documented negative effects of diversity on group functioning, such as conflict, dissatisfaction, and negative team climate (e.g., Williams & O'Reilly, 1998). The present research shows that important aspects of group functioning, such as those mentioned above, can be positively influenced by crossing different diversity dimensions. More specifically, our results indicate that groups with a potential faultline experience less task and relationship conflict, more satisfaction, and a better team climate when this potential faultline is crossed with informational diversity.

A crucial determinant of successful teamwork concerns the processing of task-relevant information (Hinsz, Tindale, & Vollrath, 1997). Informational diversity can enhance the elaboration of task-relevant information and perspectives within the group, which may increase group effectiveness (van Knippenberg et al., 2004). However, previous research suggested that the existence of diversity on other dimensions within a group may hinder the elaboration of information, and thereby impede group effectiveness (e.g., Jehn et al., 1999). The present study provides an important qualification of these earlier conclusions by showing that differences on other dimensions of diversity need not be detrimental to the positive effect of informational diversity when these different dimensions of diversity cross-cut each other.

Together, the results of the present study provide a practical point of departure for effective diversity management in organizations. To the extent that managers can influence the composition of work groups, the results of the current study suggest several important considerations regarding how to compose a team or change its composition. For one thing, it is important to make sure that teams consist of members with different informational backgrounds (e.g., expertise, knowledge, professional experience, etc.), because such teams are more likely to process task-relevant information. Secondly, managers should be aware of the potentially detrimental effects of diversity within teams. When composing a team of

employees who are diverse on both salient social-category and informational dimensions, managers should strive to combine the dimensions in such a way that they are crossed rather than converged.

Limitations and Directions for Future Research

Although experiments are not conducted in a quest for external validity (Brown & Lord, 1999; Dipboye, 1990; Mook, 1983), reports of experimental research tend to elicit questions of external validity among their readership. Obviously, then, confidence in the conclusions advanced here could be bolstered when the current results were replicated in a study of work groups in actual organizations, and this would indeed seem an important avenue for future research. Even so, it may be noted that a previous study of work group diversity inspired by similar notions (although not focusing on the interaction of diversity dimensions) obtained similar results in an experiment and in a field study (Earley & Mosakowski, 2000). Moreover, Jehn et al. (1999) argue that the negative effects we associate with converging informational and potential faultlines may also be obtained in the field. We therefore have no reason to suspect that our results are limited to experimental settings.

The primary focus of the current study was to examine the effects of cross-categorization on group processes. We decided to employ an experimental task that optimally allows for the investigation of such processes. Using this task, we shed light on the effects of cross-categorization of different diversity dimensions on some of the most important aspects of group functioning. A logical next step for future research would be to examine whether cross-categorization in work groups can also affect more tangible outcomes at the organizational level, of which the presently examined variables are predictive, such as performance, productivity, profit, psychological and physical health, absenteeism, and turnover. However, the presently used task is not particularly suited for investigating such outcome measures (cf. Hollingshead, 1996). Because the group process variables that were

examined in the present study have proven to be predictive of team performance (e.g., Bain, Mann, & Pirola-Merlo, 2001; De Dreu & Weingart, 2003; Hinsz et al., 1997; Jehn, 1995; Judge, Thoresen, Bono, & Patton, 2001), we would expect compatible results on performance dimensions in teams as well as organizations as a whole. Nevertheless, future research is needed to investigate to what extent the present conclusions generalize to organizational-level outcomes.

Conclusion

The present study was conducted to examine under which circumstances informational diversity is conducive to group functioning. In doing this, we focused on the interplay between informational diversity and other dimensions of diversity. We predicted and found that informational diversity stimulates the elaboration of task-relevant information, except when the diversity dimensions converged. Further, potential faultlines were found to increase task and relationship conflict, reduce satisfaction, and deteriorate team climate, except when they were cross-cut by informational diversity. These results point to the importance of considering the relation between different diversity dimensions when predicting group functioning. The present study indicates that informational diversity can increase elaboration of information even if groups are not homogeneous on another diversity dimension, and that potential faultlines does not necessarily have negative effects on group processes as long as they are cross-cut by another diversity dimension.

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Footnotes

[1] Phillips (2003) and Phillips et al. (2004) show the opposite for three person groups in which the minority outgroup member has different information than the two majority ingroup members. These faultline groups seem to do better than groups in which the minority outgroup member holds the same information as one of the ingroup members. However, as Phillips et al. (2004) state, these effects are limited to three-person groups, because of the unique minority position of one of the group members. Within four-person groups, with equally sized subgroups, intergroup biases are more likely to occur when faultline conditions are created, hindering information elaboration. Indeed, the results reported by Phillips et al. (2004) show that within four-person groups the alignment of subgroups and information are detrimental to team functioning.

[2] One may argue that it is impossible to determine whether the categorization resulting from the potential faultline manipulation can be ascribed to gender, to the feedback on the fake personality test, to the baseball caps, seating, or to a certain combination of these manipulations. However, the present study was not conducted to determine the *causes* of categorization but to determine the *effects* of (subgroup) categorization, and how informational diversity might strengthen or weaken these categorization processes depending on its correlation with this potential faultline. Also, the combination of stacking multiple manipulations of other dimensions of diversity and a subtle manipulation of informational diversity results in a conservative test of our cross-categorization hypothesis.

[3] A pretest with 23 participants who did not participate in the main study showed that there was no difference between men and women on the task, suggesting that the task is not gender-related, $F(1, 22) = .29$, *ns*. Also, we tested whether the participants themselves perceived the task to be gender-related by asking them whether they thought the task was more related to women or more related to men on a seven point scale (with the midpoint of

the scale [4] representing neither to women nor men). A one-sample t-test showed that the mean response (M = 4.22, SD = 0.90) did not differ from the midpoint of the scale (4; t[22] = 1.16, *ns*), showing that the participants did not perceive the task to be gender-related. Again, we found no difference in response between men and women, $F(1, 22) = .91$, *ns*.

[4] A pretest with 22 participants who did not participate in the main study showed that information parts A and B were equally informative.

[5] A confirmatory factor analysis revealed that the manipulation checks for informational diversity and information elaboration are separate constructs. The three items designed to measure information elaboration loaded on one factor, with factor loadings ranging from .71 to .90 and discriminant factor loadings ranging from -.21 to .12. The three items checking the manipulation of informational diversity all loaded on the other factor with factor loadings between .75 to .84 and discriminant factor coefficients between -.22 and .30.

[6] One could argue that for groups that interacted for a longer period of time an overestimation of relationship conflict and task conflict can occur. However, analyses revealed that the time used to complete the group task did not differ between conditions. Accordingly, when controlling for time by using time as covariate the same pattern of results was obtained (for statistical method see Hays, 1988, pp. 292-294).

Table 1

Means, Standard Deviations, Zero-Order Correlations and Partial Correlations of the Main Dependent Variables

	M	SD	1	2	3	4	5
1. Information Elaboration	4.90	0.65		-.11	-.10	-.00	.50*
2. Relationship Conflict	0.19	0.39	-.15		.44*	-.15	-.42*
3. Task Conflict	9.19	5.94	.06	.46*		.01	-.15
4. Team Climate	3.65	0.99	.16	.06	-.08		.10
5. Satisfaction	5.74	0.62	.49*	-.46*	-.24	.10	

Note. *$p < .001$. Zero-order correlations are presented below the diagonal, partial correlations above the diagonal.

Table 2

Means and Standard Deviations for Dependent Variables per Condition

Condition	1		2		3		4		5	
	PoFau - InfoHom		Converged		Crossed		NoPoFau - InfoHet		NoPoFau - InfoHom	
	M	SD	M	SD	M	SD	M	SD	M	SD
Information Elaboration	4.52	0.93	4.85	0.33	5.17	0.56	5.26	0.52	4.69	0.53
Satisfaction	5.46	0.83	5.51	0.60	5.83	0.54	5.87	0.48	6.01	0.48
Team Climate	3.86	0.41	3.95	0.97	4.90	2.24	4.70	0.80	4.26	1.01
Relationship Conflict	0.27	0.55	0.34	0.44	0.23	0.47	0.02	0.07	0.10	0.16
Task Conflict	12.21	5.43	9.79	7.90	8.52	6.05	7.68	3.05	7.87	6.11

Note. Condition 1 = potential faultline with informational homogeneity; Condition 2 = potential faultline converged with informational heterogeneity; Condition 3 = potential faultline crossed with informational heterogeneity; Condition 4 = no potential faultline with informational heterogeneity; Condition 5 = no potential faultline with informational homogeneity. The conflict data were measured by counting remarks, team climate was measured on a 5-point Likert scale.

Table 3

Contrasts Computed to Test the Hypotheses

Condition	1	2	3	4	5
	PoFau - InfoHom	Converged	Crossed	NoPoFau - InfoHet	NoPoFau - InfoHom
Hypothesis 1*	-2	-2	3	3	-2
Hypothesis 2a, b, & c*	-3	-3	2	2	2
Hypothesis 3a	-2	-2	3	3	-2
Hypothesis 3b*	-3	-3	2	2	2

Note. Condition 1 = potential faultline with informational homogeneity; Condition 2 = potential faultline converged with informational heterogeneity; Condition 3 = potential faultline crossed with informational heterogeneity; Condition 4 = no potential faultline with informational heterogeneity; Condition 5 = no potential faultline with informational homogeneity. Contrasts marked with an asterisk are significant at $p < .05$. Hypothesis 1 pertains to information elaboration. Hypothesis 2a, b, and c pertain to satisfaction, team climate, and relationship conflict. Hypotheses 3a and 3b pertain to task conflict.

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